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The Effectiveness of DD Mag'z (Digestive Disease Magazine) with Google Meet Synchronously to Improve Digestive Health Literacy

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Abstract

Digestive health literacy is important for students to be able to determine their diet, choose healthy foods, prevent and know the actions that need to be taken in treating diseases or disorders of the digestive system, and even promoting healthy living behaviors to others. This study aims to develop instructional designs to improve student health literacy with the ADDIE model. The development carried out consisted of developing lesson plans, assessment instruments, and learning media DD Mag'z (digestive disease magazine). Based on the results of the analysis, the learning design was determined using DD Mag'z and Google Meet synchronously. Expert validation was carried out assessing three aspects consisting of the feasibility of media, content, and language. The results of the validation of the developed media obtained an average value of 3.58 and were included in the very valid category so that it was suitable to be used as an alternative learning media on the concept of the digestive system. Measurement of the improvement of students' digestive health literacy skills used a dual choice instrument as a pre-test and post-test. The effectiveness analysis used a one group pre-test post-test design and obtained data that were not normally distributed. The Wilcoxon test results showed an effect of the synchronous use of DD Mag'z media with Google Meet on students' health literacy. While the results of the effectiveness test using N-Gain showed an average value of 0.41 so that the effectiveness of the instructional design developed was moderate.

Introduction

Education generally aims to change a person's behavior. Including health education aims to produce healthy living behavior (Malmberg et al., 2020). This will not be achieved if students do not have health literacy competencies. Health literacy is the ability to understand, evaluate, and make informed decisions related to health to reduce the risk of disease and lead a healthier life (Zarcadoolas et al., 2015; Kesumawati et al., 2019; Sørensen et al., 2020; Berkman et al., 2010). In a broader context, health literacy can increase a person's awareness of disease, reduce the risk of hospitalization and expensive medical costs (Okan et al., 2012). Unfortunately, based on the research results, the students' health literacy skills are still low (Permana et al., 2016). Biology learning is expected to be able to equip students with health literacy skills as early as possible. Especially in the discussion of human physiology anatomy, such as in the discussion of the digestive system.

Digestive health literacy is needed by students in order to be able to determine their diet, choose healthy foods, prevent and know the actions that need to be taken in treating diseases or disorders of the

digestive system, and even promoting healthy living to others. In improving students' digestive health literacy skills, appropriate design and instructional media are needed. Instactional media that are commonly presented usually do not stimulate students to construct their own knowledge. For example, about the recommendation to consume probiotics for sufferers of diarrhea (Nelintong et al., 2015). Conventional media or learning sources usually do not provide data on why students should consume probiotics. Students have no reason to do this. Even though all of a person's behavior needs to be motivated by rational knowledge and thinking (Siregar & Siregar, 2013; Garrecht et al., 2020). Therefore, it is necessary to integrate research results so that students have rational reasons for doing something (Ristanto et al., 2018).

Learning media is a very important part of the learning process (Kozma, 1994; Akbar & Mukminan, 2019). Learning media can be defined as all communication tools both printed, graphic, animation, audio, and audiovisual that are used to share knowledge with others (Omodara & Adu, 2014). The results of the study show that biology learning will be more effective through the use of visual media, teaching through practical work, combining various learning techniques, and connecting topics with everyday life (Çimer, 2012). Therefore, it is necessary to develop learning media that can meet the needs of students related to biology learning. The media to be developed is DD Mag'z or digestive disease magazine, this magazine contains various diseases and disorders of the digestive system that are often experienced daily. The discussion includes the causes, symptoms, prevention, and treatment of diseases of the digestive system. Some parts of the discussion about disease use tables, graphs, and charts of research results so that students can build their own knowledge through the data presented. This is important because the ability to interpret data is an indicator of scientific literacy skills (OECD, 2016; Suwono & Furaidah, 2016).

Covid-19 pandemic does not provide many choices of learning methods. Learning methods that are commonly applied are synchronous and asynchronous online learning methods (Hrastinski, 2008). Synchronous learning can be defined as learning that is carried out by the teacher and students at the same time, while in asynchronous learning students learn at different times from the teacher (Mehri & Uplane, 2015). In this research, learning will be carried out synchronously using Google Meet. The limitation of the internet network is one of the obstacles to synchronous online learning, so DD Mag'z must be able to be accessed asynchronously as well so that students can learn independently (Kurniasari et al., 2020).

Health literacy is needed to improve a person's quality of life. Biology learning in junior high schools is expected to be able to equip students with health literacy skills. Therefore, it is necessary to develop learning media that is oriented towards increasing this ability. DD Mag'z is an instructional media designed to be able to improve students' digestive health literacy skills.

Methods

The research method used in this study is the research and development (R&D) method using the ADDIE instructional design. The ADDIE model is used as a framework in designing and developing effective education and learning programs (Kurt, 2018; Aldoobie, 2015). The stages of ADDIE instructional design development consist of five stages, namely analysis, design, development, implementation, and evaluation as shown in Figure 1. (Torrey & Emrah, 2019; Kurt, 2018; Aldoobie, 2015). Next will be discussed about each of the stages of ADDIE instructional design development.

Figure 1. The Stages of ADDIE Instructional Design Development

The first ADDIE instructional design development stage is the analysis stage. The analysis stage is the stage of setting instructional goals (Kurt, 2018). At this stage the competencies that will be achieved by students are determined after learning. The analysis stage consists of learner analysis, instructional objective analysis, development of instructional analysis, and development of learning objectives (Aldoobie, 2015). The next stage is the design stage, this stage aims to determine the measuring instrument, material analysis, planning the learning process, the media or teaching materials used, and other learning support components (Torrey & Emrah, 2019).

The next stage is the development stage, at this stage the development of a instructional process plan document, instruments and instructional media will be used. The learning process that will be carried out is synchronous online learning using the Google Meet platform, and evaluation using the pre-test and post-test instruments. Furthermore, a feasibility test was carried out with expert validation of the media being developed. Input from experts related to the media developed into material for improvement of the media that has been developed. Expert test results are interpreted into a product feasibility scale as in Table 1 referring to Ratumanan & Laurens (2006) in (Amirulmukminin & Aprianti, 2019).

Table 1. Expert Validation Criteria

No	Interval Category	Criteria
1	3,25 < x ≤ 4,00	Very valid
2	2,50 < x ≤ 3,25	Valid
3	1,75 < x ≤ 2,50	Less valid
4	1,00 < x ≤ 1,75	Not valid

The study population was all students of SMPN 1 Balaraja, then 27 eighth grade students were selected using simple random sampling technique. The next stage is implementation, at this stage learning is carried out according to the learning design that has been designed through the instructional plan. The next stage is the evaluation stage, at this stage the learning effectiveness test is carried out by determining the average N-Gain value from the pre-test and post-test results. The N-Gain value is obtained using Eq. (1).

$$N - Gain = \frac{Posttest\ score - Pretest\ score}{Ideal\ score - Pretest\ score} \qquad (1)$$

The average N-Gain value is then interpreted based on Table 2.

Table 2. Table Categories of N-Gain Effectiveness Interpretations

No	N-Gain average	Interpretation
1	N-Gain > 0,7	High effectiveness
2	0,7 > N-Gain > 0,3	Moderate effectiveness
3	N-Gain < 0,3	Low effectiveness

Source: Hake (1999)

Results and Discussion

At the analysis stage, learner analysis, instructional objective analysis, development of instructional analysis, and development of learning objectives are carried out (Aldoobie, 2015). Starting with the learner analysis stage, in this study the students were 8th grade students of SMPN 1 Balaraja with an average cognitive ability based on the science learning outcomes in the previous discussion. The instructional objective of this study was to improve students' digestive system health literacy. The health literacy indicator consists of three components, namely caring for one's own health, preventing disease, and promoting health (Sørensen et al., 2020).

The indicators of health care consist of the ability to access health information, the ability to understand health information, the ability to interpret and evaluate health information, and the ability to make decisions about health problems based on the information obtained. Disease prevention indicators consist of the ability to access information about health risk factors, the ability to understand information about health risk factors, the ability to interpret and evaluate information about health risk factors, and the ability to make decisions about disease risk factors for health based on the information obtained.

Health promotion indicators consist of the ability to update oneself information about various determinants of health, the ability to understand information about the determinants of health, the ability

to interpret and evaluate information on determinants of health, and the ability to inform decisions about the determinants of health. The instrument used to measure students' digestive system health literacy skills was multiple choice questions with the help of the google form application. Based on the analysis of the indicators and consideration of the evaluation instruments used, instructional objectives were prepared.

After learning, students are expected to be able to mention disorders and diseases of the digestive system, explain the causes, symptoms, diagnosis, prevention, and treatment of diseases and disorders of the digestive system, translate data in the form of tables, graphs and pictures related to diseases that attack the digestive system, be able to use knowledge of the digestive system and its diseases to make decisions in terms of maintaining a healthy digestive system.

In the next stage, the learning design will be carried out. The learning design carried out was synchronous online learning because learning was carried out during the COVID-19 pandemic with the help of Google Meet and DD Mag'z. This learning activity was carried out for 90 minutes, with the initial 15 minutes being an introduction, the next 60 minutes being the delivery of teaching materials using DD Mag'z, and the last 15 minutes being the closing. The evaluation was carried out using a multiple-choice instrument of 10 questions as pre-test and post-test which were arranged based on instructional objectives. The electronic magazine developed consists of an introduction, content, and cover (Silva, 2011). The introduction contains instructional objectives, and a profile of the composer. The content section discusses various kinds of diseases and disorders of the digestive system, equipped with tables, charts, and pictures based on the research results. The closing section contains a glossary (Akbar & Mukminan, 2019).

At the development stage, a learning implementation plan (RPP) is prepared. The available learning time allocation is 90 minutes with 15 opening minutes including pre-test, 60 minutes of core activities, and the next 15 minutes of closing and post-test. The research instrument developed was in the form of multiple-choice questions related to students' understanding of the causes, symptoms, prevention and treatment of diseases and disorders of the digestive system. The lattice instrument used is shown in Table 3 after discussions with other science teachers.

Table 3. Aspects and Indicators of Students' Digestive Health Literacy Instruments

Instructional Purpose	Question indicator	Question number
Students are able to explain the causes, symptoms, diagnosis, prevention, and treatment of diseases and disorders of the digestive system;	• Be able to understand that increasing protein consumption can prevent obesity	1
	• Able to sort the microorganisms that cause diarrhea from the highest to the lowest based on a pie chart	4
	• Understand the action of gastritis drugs in the stomach	9
Students are able to translate data in the form of tables, graphs, and pictures related to diseases that attack the digestive system;	• Able to calculate BMI and classify it based on BMI category	3
	• Able to determine the main factors causing hepatitis transmission based on a pie chart	6
	• Able to interpret data on the increase in obesity cases in Indonesia	2
	• Determine the provinces in Indonesia that are likely to experience a lot of kwashiorkor based on the level of protein consumption	7
Students are able to use their knowledge of the digestive system and its diseases to make decisions in terms of maintaining a healthy digestive system	• Determine what to do when dehydration occurs due to diarrhea	5
	• Determine the benefits of probiotics for the digestive system	8
	• Determine high-fiber foods that are good for digestion	10

At the DD Mag'z development stage, a magazine was compiled using the CorelDraw 2019 and Photoshop CS 5 applications. This electronic magazine consists of an introduction, content, and cover. The introduction contains instructional objectives, and a profile of the composer. The content section discusses various kinds of diseases and disorders of the digestive system, equipped with tables, graphs, and pictures

based on research results to improve students' scientific literacy skills (OECD, 2016). The contents section discusses 10 diseases and disorders that commonly occur in the digestive system consisting of obesity, diarrhea, ulcers, constipation, hepatitis, hemorrhoids, appendicitis, canker sores, kwashiorkor, and intestinal worms. Each disease discussion consists of causes, symptoms, diagnosis, prevention, and treatment. As in Figure 1, which explains obesity, what is obesity, how to calculate BMI (body mass index), and tips to avoid obesity. The closing section contains a glossary to assist students in understanding new terms that are not yet understood (Akbar & Mukminan, 2019).

After developing the learning media in the form of the DD Mag'z electronic magazine, an expert validation test was carried out on the product being developed. The magazine component that is assessed is related to the aspects of the feasibility of content, media, and language. The validation instrument was developed referring to the Badan Standar Nasional Pendidikan (2014). After conducting an expert test, it was obtained an average value of 3.33 so that it was categorized as very valid and suitable for use as a learning medium by first making revisions.

Figure 2. (a) The Cover Section of DD Mag'z, (b) Part of the Contents of DD Mag'z

Based on the expert tests that have been carried out, there are several entries including the addition of a preface or introduction to the front, the author's profile should be put at the end, use consistent symbols, and add pictures in each discussion so that it is more interesting. The addition of pictures is an important part because it can describe the teaching material to be more concrete and realistic (Bustami et al., 2019). After making improvements, an average value of 3.58 was obtained, with the details of each expert as in Table 4. Based on the table of validity criteria, the DD Mag'z media developed was included in the very valid category.

Table 4. Results of Expert Validation on Content, Media, and Language Aspects

Assessment Indicators	Assesment point	Expert Validation Results		
		Expert 1	Expert 2	Expert 3
	Content Feasibility			
A. Suitability of the material with the curriculum	1. Completeness of the material;	4	4	4
	2. Extent of the material;	4	3	4
	3. Depth of material;	3	4	3
B. Accuracy of Material	4. Accuracy of concepts and materials;	3	3	3
	5. Accuracy in principle;	3	4	3
	6. Accuracy of facts and data;	3	4	3
	7. Sample accuracy;	4	4	4
	8. Accuracy of drawings, diagrams and illustrations.	3	3	4
	9. Accuracy of notations, symbols and icons.	4	3	3
	10. The accuracy of library sources;	3	4	4
C. Up-to-date material	11. Withdrawal of material;	4	4	4
	12. Encourage seeking further information;	4	4	3

		13. Suitability of the material with the development of science;	4	4	3
		14. Actual pictures, diagrams and illustrations;	4	3	4
		15. Using examples of cases in Indonesia and abroad	4	4	4
		Media Feasibility			
D.	Presentation Technique	16. Consistency of the systematic presentation in learning activities.	4	3	3
		17. Presentation clutter	4	4	3
E.	Serving Support	18. Introduction	4	4	4
		19. Glossary	4	4	4
		20. Bibliography	4	4	4
F.	Completeness of Presentation	21. The introduction section	4	4	4
		22. The content section	4	3	3
		23. The closing section	4	4	3
		Language eligibility			
G.	Straightforward	24. The accuracy of the sentence structure	3	3	3
		25. The effectiveness of the sentence	3	4	3
		26. Standardization of terms	3	3	3
H.	Communicative	27. Message attainment	4	3	3
		28. The accuracy of using language rules	3	3	3
I.	Dialogical and communicative	29. Ability to motivate	4	3	3
		30. The ability to encourage critical thinking	3	4	4
J.	Suitability with the level of development of students;	31. The suitability of the intellectual development of students.	3	3	4
		32. Conformity with the level of emotional development of students.	3	4	3
K.	Cluster and coherence of thought lines	33. Cluster and integration between learning activities	4	4	4
		34. The coherence and coherence between paragraphs	4	3	3
L.	Use of terms, symbols and icons	35. Consistent use of terms.	4	4	3
		36. Consistent use of symbols or icons.	4	4	3
Average of each expert			**3,69**	**3,63**	**3,42**
Average				**3,58**	

At the application stage, learning is carried out according to the learning implementation plan that has been compiled. There are several obstacles in implementing synchronous learning, including ensuring students pay attention to the teacher's explanation. Therefore, teachers must often confirm student understanding while ensuring students pay attention to the teacher's explanation from beginning to end.

At the evaluation stage, the effectiveness test of using DD Mag'z media was carried out with the help of Google Meet synchronously, the effectiveness test was carried out on 27 students and the pre-test average score was 44.44 and the post-test average score was 67. 41 as in Table 5. These results indicate an increase in students' digestive health literacy skills.

Table 5. Obtaining the Average Value of The Pre-Test and Post-Test

	N	Minimum	Maximum	Mean	Std. Deviation
PreTest Eksperimen	27	10	80	44.44	17.172
PostTest Eksperiment	27	40	100	67.41	15.589
Valid N (listwise)	27				

The results of the data normality test using the Kolmogorov-Smirnov method show that the data is not normally distributed, therefore to determine whether there is an effect of using DD Mag'z with google meet synchronously on digestive health literacy using the Wilcoxon test (Artaya, 2018). The data analysis process uses the SPSS 25 for windows application (Raharjo, 2019). Based on the results of the analysis of the pre-test and post-test results, it was found that one student experienced a decrease in post-test results, 24 students experienced an increase in post-test results with an increase in the average score of 13.38, and two students did not experience an increase or decrease (Table 6).

Table 6. Analysis of Students' Pre-Test and Post-Test Results

		N	Mean Rank	Sum of Ranks
Posttest – Pretest	Negative Ranks	1[a]	4.00	4.00
	Positive Ranks	24[b]	13.38	321.00
	Ties	2[c]		
	Total	27		

a. Posttest < Pretest
b. Posttest > Pretest
c. Posttest = Pretest

The basis for making the Wilcoxon test decision is if the Asymp. Sig <0.05 then the hypothesis is accepted and if the value is Asymp. Sig> 0.05, the hypothesis is rejected. The Wilcoxon test results obtained the Asymp value. Sig 0,000 which shows a significance value smaller than 0.05 (Table 7). So that the hypothesis is accepted and it can be concluded that there is an effect of using DD Mag'z with Google Meet synchronously affecting students' digestive health literacy (Raharjo, 2019).

Table 7. Hasil Uji Wilcoxon

	Posttest – Pretest
Z	-4.300
Asymp. Sig. (2-tailed)	.000

The next stage is an N-Gain test to determine the effectiveness level of using DD Mag'z with the help of Google Meet synchronously. N-Gain mean value. The results of the N-Gain calculation obtained a value of 0.41, so it can be concluded that the use of DD Mag'z with the help of Google Meet synchronously is included in the medium effectiveness category to improve students' digestive system health literacy.

The results of expert validation show that the developed magazine falls into the very valid category. This shows that the media developed is good in terms of appearance, language and content. The difference between DD Mag'z and other media or learning sources is in the content of the material being developed. In DD Mag'z there are several concepts such as how to calculate BMI independently and determine the class, showing the results of research on the increase in obesity sufferers in Indonesia, the microorganisms that cause diarrhea, the main factors causing hepatitis transmission, the benefits of probiotics, to the level of protein consumption of children in Indonesia (Elisanti, 2017). The content aims to make students have good health literacy, namely caring about their own health, being able to avoid disease risk factors, to promoting healthy living (Sørensen et al., 2020).

The DD Mag'z effectiveness test with the synchronous learning method showed fewer effective results. This can occur because the COVID-19 pandemic condition causes learning to be done online. Synchronous online learning requires a prime internet network, network disruption will cause the learning process to be interrupted (Adnan & Anwar, 2020). That is why the synchronous method is still rarely used by teachers at the primary and secondary school level (Anugrahana, 2020). Even though the use of technology in learning still experiences many obstacles, technology must still be used in every lesson. Because technology is very useful to survive in the future (Ningsih et al., 2019).

Another obstacle is the difficulty of drawing students' focus on the material presented, even though there have been repeated confirmations regarding the understanding of the teaching material. The ineffectiveness of the media being developed can also be caused by the media being developed which is less

interactive, but this is circumvented by using synchronous learning with Google Meet so that student and teacher interactions continue.

There are not many media or learning resources in circulation that integrate the latest research results on teaching materials. The development of DD Mag'z can be an alternative learning media for the digestive system material at the junior high school level. The presentation of tables and graphs based on the research results stimulates students to form their own knowledge. For example, in one of the DD Mag'z content there is a pie chart regarding microorganisms that are a factor in the occurrence of diarrhea. The pie chart shows the percentage of diarrhea-causing microorganisms such as rotavirus, *E. Coli, adenovirus, Salmonella sp*. (Bonkoungou et al., 2013). Based on the diagram, students are able to identify the microorganisms that cause diarrhea the most and are expected to be able to determine preventive measures to avoid these microorganisms.

In addition, there are not many learning media that are oriented towards improving health literacy. Some of the media or teaching materials developed are oriented towards scientific literacy but not many are specific to students' health literacy. Material related to health becomes one of the materials that motivates students to understand science further (Zeyer & Dillon, 2019). After using DD Mag'z as a learning media, students are expected to be able to avoid obesity, especially in the COVID-19 pandemic, which causes reduced physical activity, diligently washing hands, not consuming random food, avoiding alcohol, and starting to consume probiotics and healthy foods.

Conclusions and Recommendations

Based on the ADDIE instructional design research, DD Mag'z (Digestive Disease Magazine) learning media was developed which will be implemented synchronously with Google Meet. Based on the expert validity test, the final result was 3.58 so that the developed teaching media was categorized as very valid. Meanwhile, the Wilcoxon test results show an influence between the two variables. The effectiveness test by calculating the N-gain from the pre-test and post-test values obtained a value of 0.41 so that the effectiveness of DD Mag'z with google meet synchronously was classified as having moderate effectiveness.

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